



U.S. Patent Application Serial No. 10/781,684
Amendment filed November 17, 2006
Reply to OA dated July 17, 2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 Claim 1 (currently amended): A quantum semiconductor device comprising:
2 a first semiconductor layer formed over a substrate and having a two-dimensional carrier gas
3 formed in;
4 a quantum dot formed over the first semiconductor layer;
5 a second semiconductor layer formed over the first semiconductor layer, burying the quantum
6 dot;
7 a dot-shaped structure formed on the surface of the second semiconductor layer at a position
8 above the quantum dot;
9 a gate electrode electrically connected to the dot-shaped structure;
10 source/drain regions formed in the second semiconductor layer on both sides of the quantum
11 dot; and
12 oxide layers formed on both sides of the dot-shaped structure on the upper surface of the
13 second semiconductor layer,
14 wherein depletion regions are formed in regions of the first semiconductor layer, which are
15 below the oxide layers, the depletion regions define a channel region, and the source/drain regions
16 are connected to both ends of the channel region, and

17 the dot-shaped structure is caused to form on the surface of the second semiconductor layer
18 at a position above the quantum dot due to crystal strains generated in the surface of the second
19 semiconductor layer due to the presence of the quantum dot.

Claim 2 (canceled).

1 Claim 3 (original): A quantum semiconductor device according to claim 1, wherein
2 the quantum dot is in a three-dimensionally grown island self-assembled by S-K mode.

1 Claim 4 (original): A quantum semiconductor device according to claim 1, wherein
2 the dot-shaped structure is in a three-dimensionally grown island self-assembled by S-K
3 mode.

Claims 5-7 (canceled).

1 Claim 8 (original): A quantum semiconductor device according to claim 1, wherein
2 a distance between the two-dimensional carrier gas and the quantum dot is 5 nm or less.

1 Claim 9 (original): A quantum semiconductor device according to claim 1, wherein
2 the dot-shaped structure is in another quantum dot or an anti-dot.

1 Claim 10 (original): A quantum semiconductor device according to claim 1, wherein
2 at least a part of the dot-shaped structure is oxidized.

1 Claim 11 (currently amended): A method for fabricating a quantum semiconductor device
2 comprising the steps of:

3 forming over a substrate a first semiconductor layer with a two-dimensional carrier gas
4 formed in;

5 forming a quantum dot over the first semiconductor layer;

6 forming a second semiconductor layer, burying the quantum dot;

7 forming a dot-shaped structure on the surface of the second semiconductor layer at a position
8 above the quantum dot due to strains generated in the surface of the second semiconductor layer due
9 to the presence of the quantum dot; [[and]]

10 forming oxide layers on the upper surface of the second semiconductor layer on both side of
11 the dot-shaped structure with the dot-shaped structure as a mark to thereby form depletion regions
12 in regions of the first semiconductor layer below the oxide layers, and define a channel region by the
13 depletion regions;

14 forming source/drain regions connected to both ends of the channel region in the second
15 semiconductor layer; and

16 forming a gate electrode electrically connected to the dot-shaped structure.

1 Claim 12 (withdrawn): A method for fabricating a quantum semiconductor device according
2 to claim 11, further comprising, after the step of forming the oxide layer,
3 the step of forming source/drain regions with the oxide layer as a mark.

1 Claim 13 (withdrawn): A method for fabricating a quantum semiconductor device according
2 to claim 11, wherein
3 in the step of forming the quantum dot, the quantum dot in a three-dimensional grown island
4 is self-assembled by S-K mode.

1 Claim 14 (withdrawn): A method for fabricating a quantum semiconductor device according
2 to claim 11, wherein
3 in the step of forming the dot-shaped structure, the dot-shaped structure in a
4 three-dimensional grown island is self-assembled by S-K mode.

1 Claim 15 (withdrawn): A method for fabricating a quantum semiconductor device according
2 to claim 11, wherein
3 in the step of forming an oxide layer, the oxide layer is formed by bringing a needle-shaped
4 conductor close to the surface of the second semiconductor layer and applying a voltage between the
5 needle-shaped conductor and the substrate.

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1 Claim 16 (withdrawn): A method for fabricating a quantum semiconductor device according
2 to claim 15, wherein
3 the needle-shaped conductor is a probe of an atomic force microscope.

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